5.9 GHz DSRC Vehicle-based Road and Weather Condition Application

8/13/2014

2014 RWM Stakeholder Meeting

Cooperative Transportation Systems Pooled Fund Study (CTS PFS)

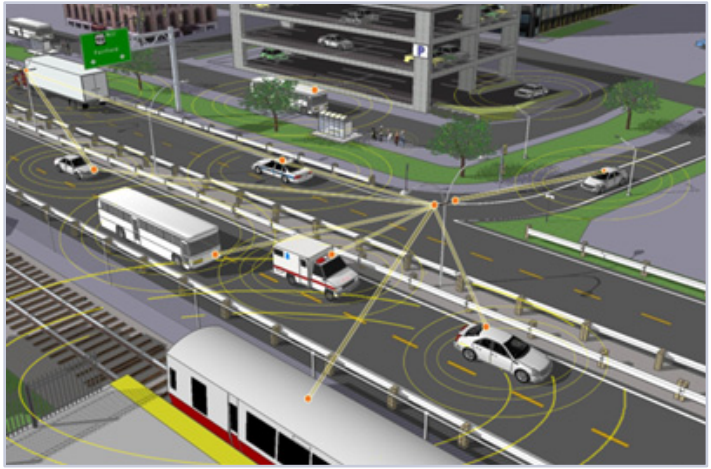
- CTS PFS is a group of 13 state and local transportation agencies and FHWA
- Focused on research and application development to prepare agencies for the deployment of connected vehicle (CV) technology
- CTS PFS has contracted with Synesis Partners (with Parsons Brinckerhoff and NCAR) to demonstrate a 5.9 GHz DSRC vehicle-based road and weather condition application

Project Objectives

- Develop and test acquisition of weather and road condition data from DSRC-equipped agency vehicles
  - From the vehicle's data bus
  - From supplemental devices like plows, spreaders and mobile road weather sensors
- Transmit the data to DSRC roadside equipment
- Send the data to a weather data service
- Enable storing/processing the data in WxDE/VDT

5.9 GHz DSRC

- Dedicated Short-Range Communication (DSRC) is a variant of Wi-Fi that provides high-bandwidth over short distances for mobile /vehicular units
- Range of communications is at least 300 up to 1000 m
- Vehicles are equipped with on-board DSRC units (OBUs) that broadcast to and receive from other OBUs and roadside units (RSUs)



(Source: USDOT)

Major Project Elements

- Task 1: Messaging Requirements Development
  - Based on road weather and DSRC standards
- Task 2: Concept of Operations
  - Consistent with Connected Vehicle Road Weather application concepts
- Task 3: Applications Development
  - Primarily OBU hardware and software
- Task 4: Application Installation
  - Operating along NYSDOT's Long Island Expressway

Messaging Requirements

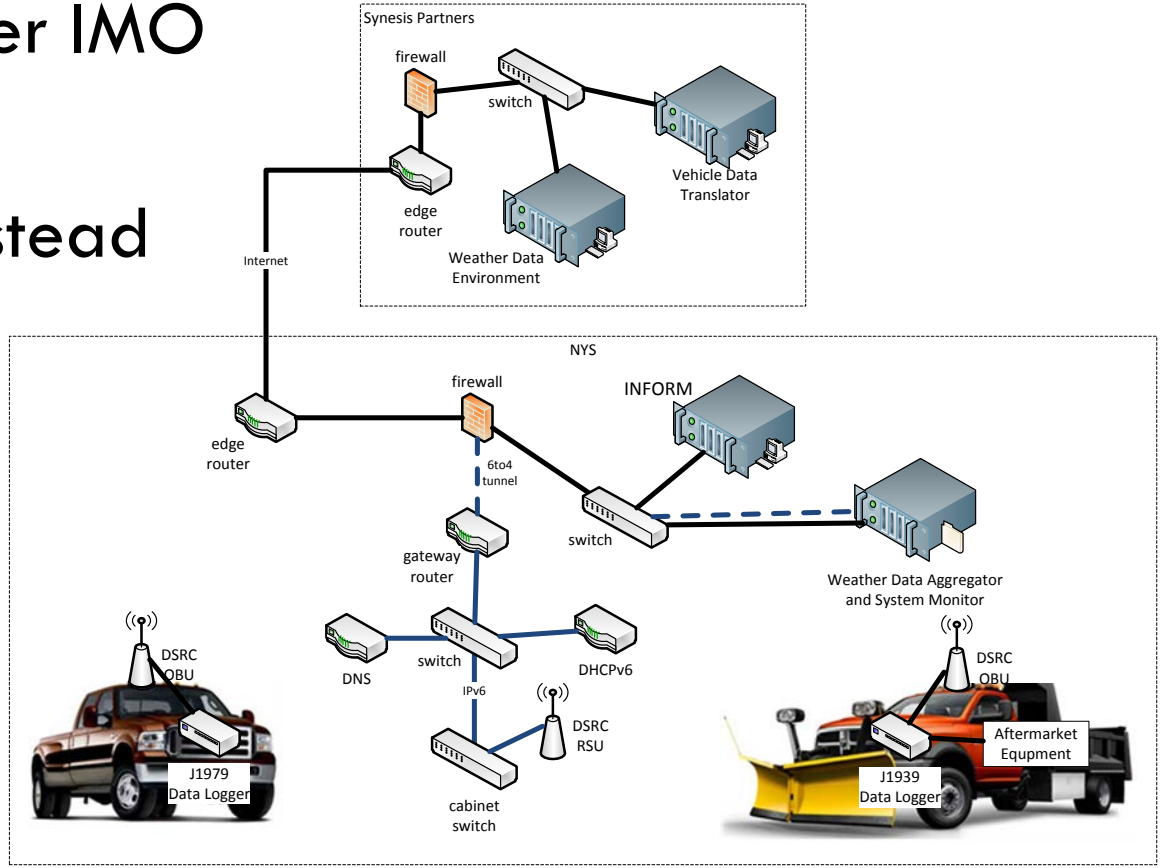
- Gathering road and weather data from vehicles is driven by what data vehicles can provide
- Relevant standards include
  - DSRC radios
  - Communications over DSRC
  - Data bus standards for light and heavy vehicles
  - Messages sent over DSRC
    - Basic Safety Message
    - Probe Vehicle Data Message

CV Weather Data Elements

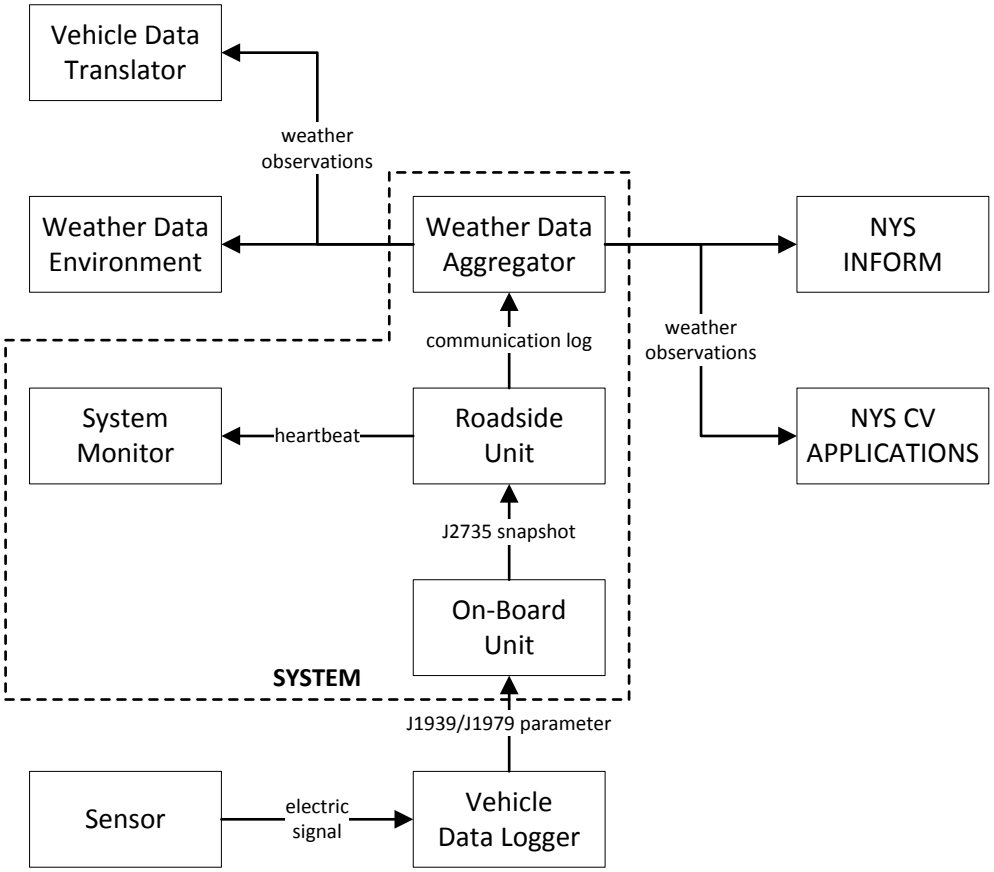
- CAN Bus data from the vehicle
  - Exterior lights
  - Wiper status/rate front/rear
  - Sun data
  - Rain state/rate
  - Air temp
  - Air pressure
  - Solar radiation
  - Mobile Friction
- Location/time from GPS
- Data from third-party equipment (plows and spreaders)
- Data from third-party weather sensors

Deployment Concept

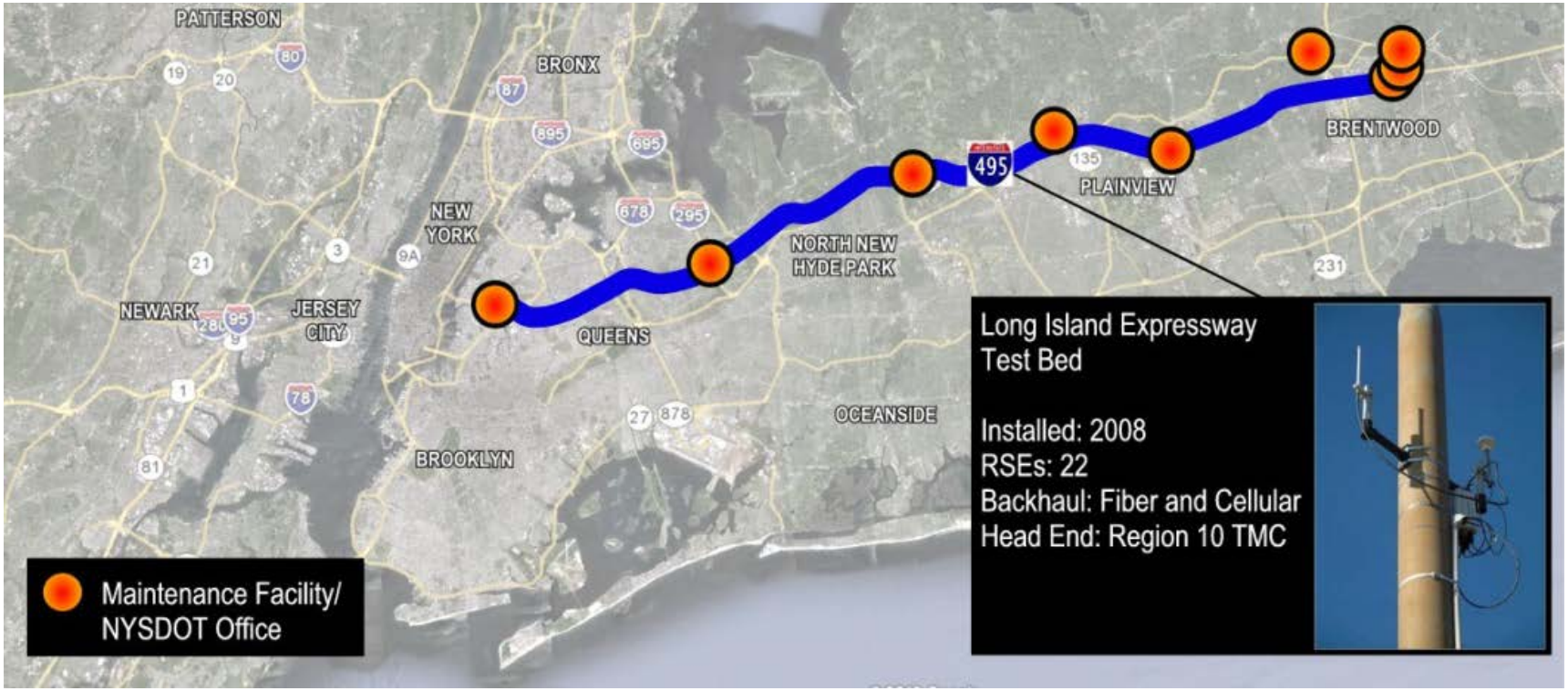
- Similar to other IMO deployments
- Uses DSRC instead of cellular from vehicles to roadside



System Data Flows



Roadside Unit Deployment



- New RSUs replacing two existing units on the LIE

Physical Installation of RSU

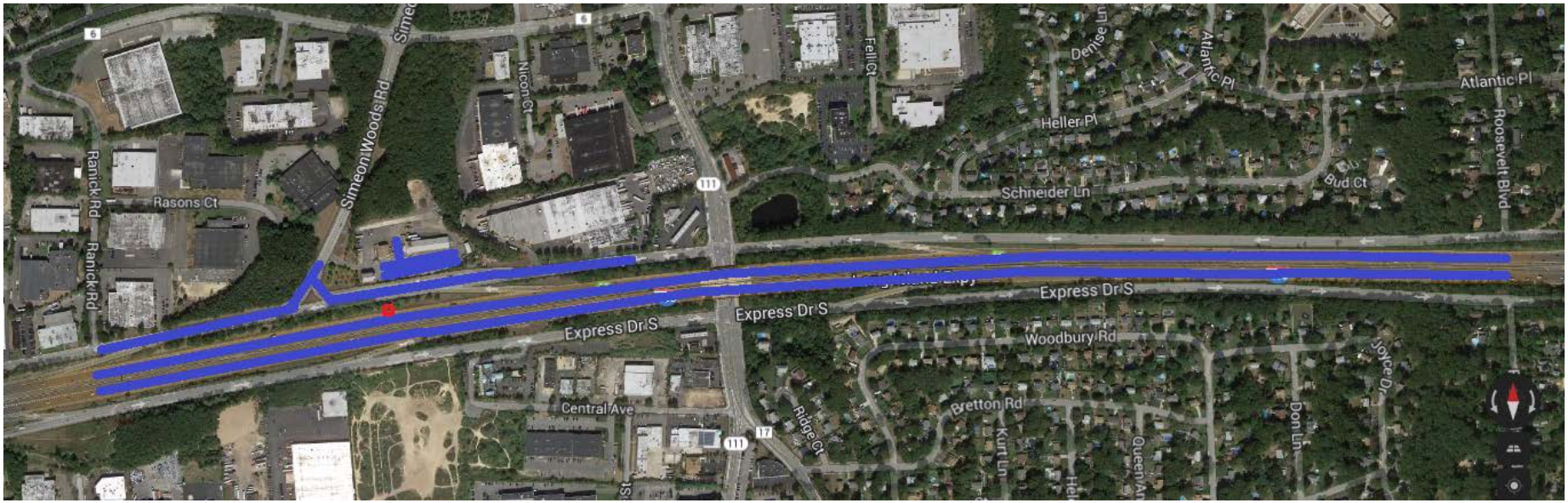
Kapsch
2.x RSU

Savari
3.x RSU

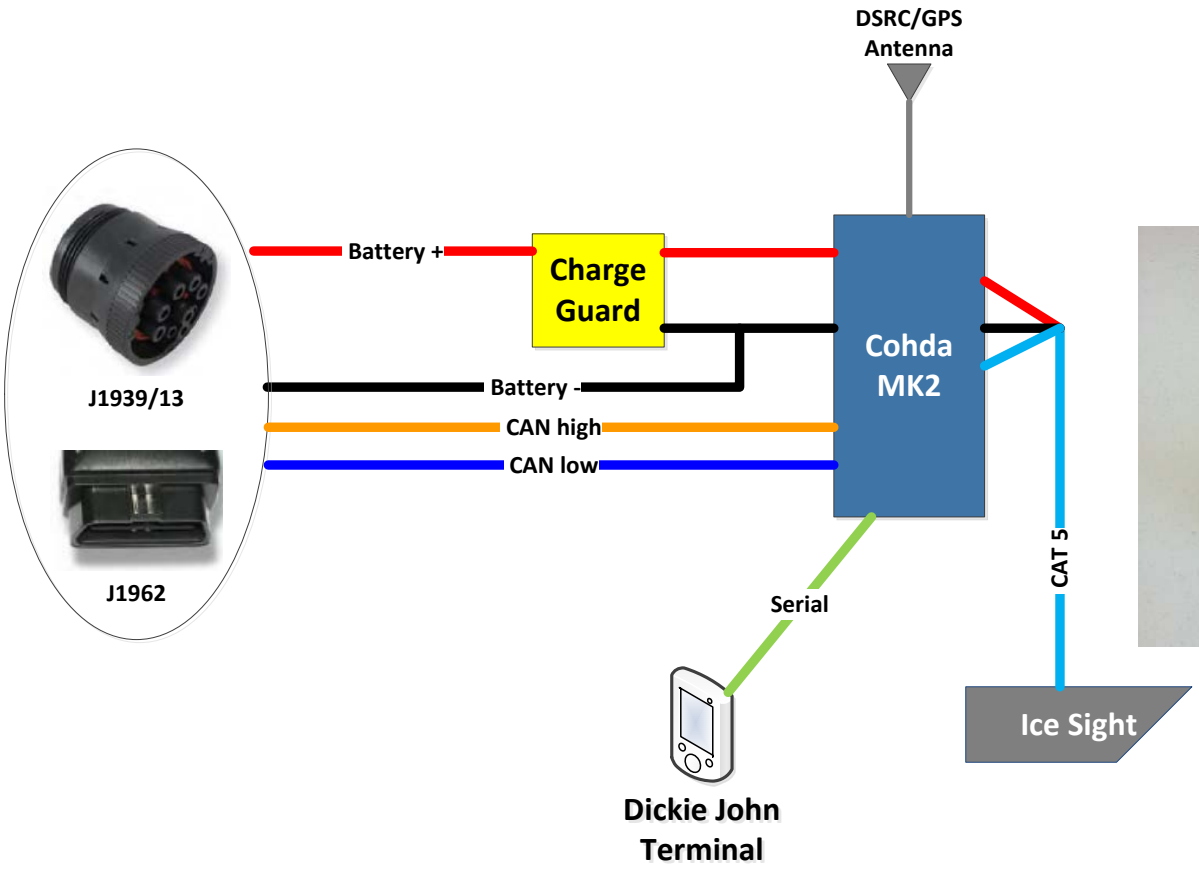
RSU Radio Testing

- Connected DSRC testing equipment to test vehicle
- Verified DSRC coverage
  - South side of maintenance yard
    - Areas of yard blocked by buildings
  - East of site on LIE at Roosevelt Blvd
    - Decreasing road elevation improves range
  - West of site on LIE at Ranick Rd
    - Heavy tree line reduces range
  - Same coverage eastbound or westbound on LIE

RSU Radio Testing

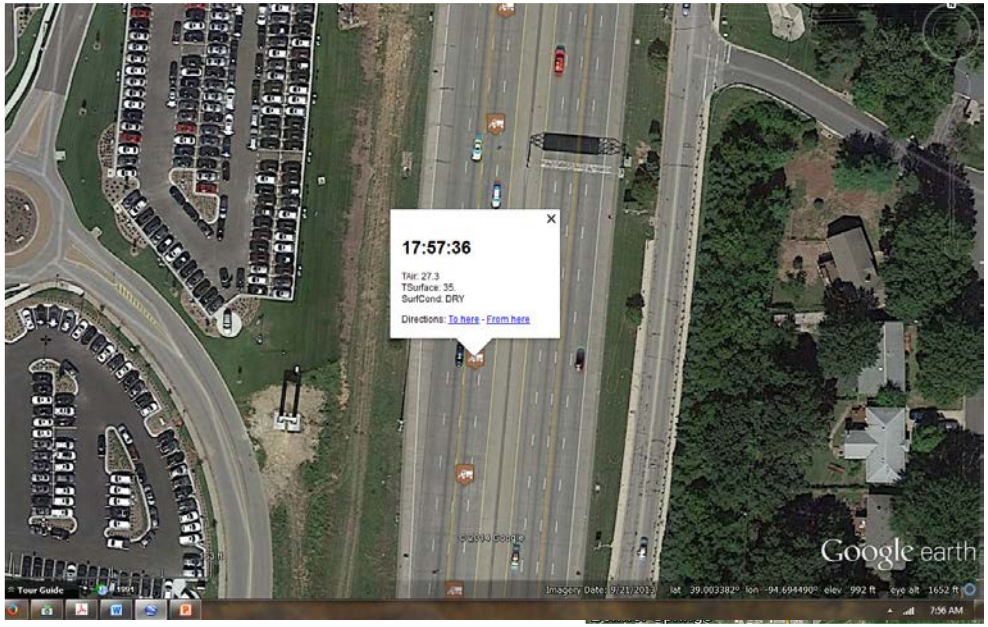


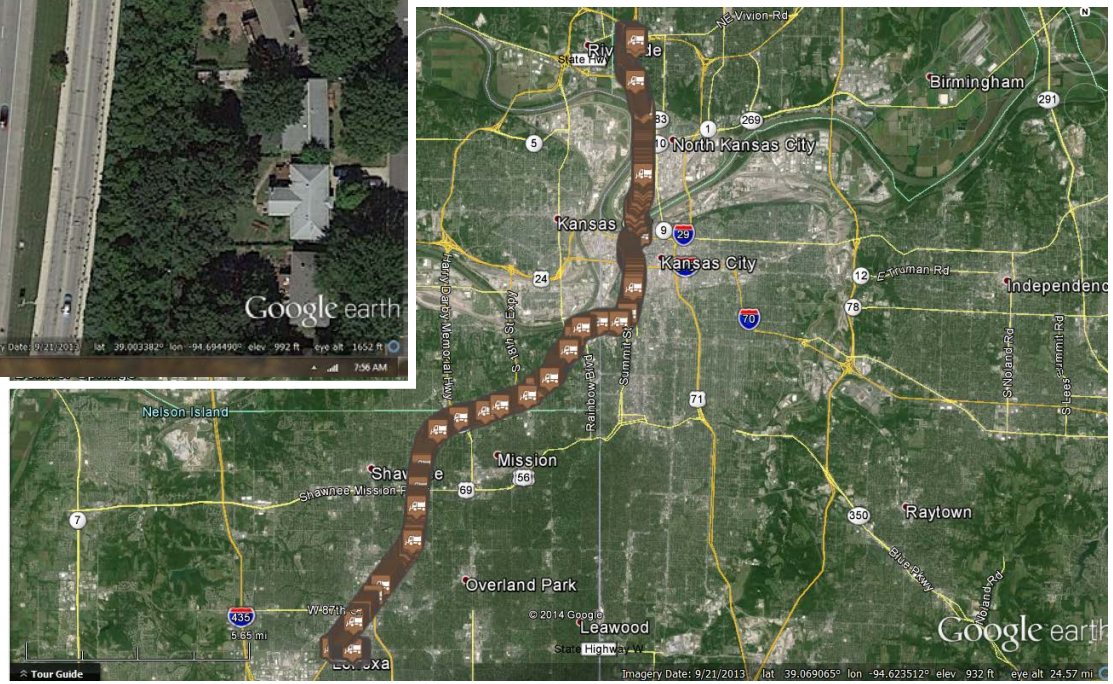
On-board Installation



(Source: High Sierra Electronics)

Integration Testing to Date





Opportunities and Accomplishments

- Developing a prototype DSRC-based application supporting DOT road weather operations
- Updating the NYSDOT DSRC demonstration test bed
- Demonstrating operations that gather probe data from DOT vehicles over DSRC
- Providing a new data feed for the WxDE

Risks and Challenges Overcome

- Standardizing the DSRC implementation
  - Messaging for probe data
  - RSU configurations
  - Network configurations
  - On-board unit configurations
- Deployment and operations
  - RSU siting to reduce vehicle-to-server data latency

Status and Next Steps

- Completed Messaging Requirements and Concept of Operations
- Deployed first RSU
- Configured IPv6 backhaul network
- Finishing OBU development
- Deploy OBUs 2014Q3
- Operations through 2014Q4
- Final Report December 2014

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